

Zoogeographic and Taxonomic Notes on Spiders of the Subfamily Heptathelinae (Araneae, Mesothelae, Liphistiidae)

By

Hirotsugu ONO*

小野展嗣*：キムラグモ亜科（クモ目，ハラフシグモ亜目，ハラフシグモ科）の
クモ類の動物地理学および分類学的知見

Introduction

Trapdoor spiders of the family Liphistiidae (Araneae, Mesothelae) are composed of two recent subfamilies, Liphistiinae and Heptathelinae, both distributed in East Asia, from Myanmar, through southern Japan, China, Vietnam, Thailand and the Malay Peninsula, to Sumatra. More than 70 species of genera *Liphistius* SCHIÖDTE, 1849 (Liphistiinae), *Heptathela* KISHIDA, 1923 and *Ryuthela* HAUPT, 1983 (Heptathelinae), were known in this family. Of these, about 30 species were described under the subfamily Heptathelinae from Japan, China and Vietnam (HAUPT, 1983; SONG & HAUPT, 1984; ONO, 1997, 1998, 1999, 2000; SONG, ZHU & CHEN, 1999).

During a collecting trip made in the course of Natural History Researches in the Region around Seto Inland Sea, in 1998, I obtained data on the distribution of *Heptathela kikuyai* ONO, 1998, from the north-western part of Shikoku (Ehime Pref.), the northeastern part of Kyushu (Oita and Fukuoka Pref.), and the southwestern part of Chugoku District (Yamaguchi and Hiroshima Pref.) of Honshu. This region is remarkable not only as the easternmost edge of distributional range of the genus *Heptathela sensu lato* but also as that of the whole range of the suborder Mesothelae. Some zoogeographic notes are presented on the basis of results of the research.

Taxonomic notes are also given on heptatheline spiders. In the recent paper of mine (ONO, 1999), I performed a discussion on phylogeny of spiders of the genera *Heptathela sensu lato* and *Ryuthela*, and the known species were classified into five groups. These groups are raised into the generic level in this paper.

Before going further, I wish to express my sincere thanks to Dr. Narayoshi KIKUYA, Oita, for his kind aid in my field researches. Many thanks are also due to all the staff of the Department of Entomology, Hanoi Agricultural University, especially to Prof. HA Quang Hung, Dr. NGUYEN Duc Khiem and Mr. TRAN Dinh Chien, and to Mr. DAO Van Khuong, Director of the Cuc Phuong National Park, Vietnam. This study was supported by the Grants-in-aid Nos. 06041116 and 09041167 for Field Research of the Monbusho International Scientific Research Program, and Nos. 07640944 and 10640688 for Scientific Research from

* Department of Zoology, National Science Museum, Tokyo
国立科学博物館 動物研究部

the Ministry of Education, Science, Sports and Culture, Japan.

Zoogeographic notes

The known distributional range of spiders of the subfamily Heptathelinae is shown in Fig. 2. The northeastern edge of the range is situated in Kyushu, Japan. Although spiders of *Heptathela* are distributed widely in central and southern parts of Kyushu (ONO, 1998), they have not been found from western part of Chugoku District, Honshu, western part of Shikoku and the northern part of Kyushu (SAWAGUTI & OZI, 1937; NAKAHIRA, 1973; KIKUYA, 1993). In the present research I made a collecting trip around this interesting region between Honshu, Shikoku and Kyushu. Intensive field researches were made in the following areas: Sata-misaki Peninsula, in Ehime Pref., Saganoseki Peninsula, Oita-gun, Hayami-gun, Usa-gun and Shimoge-gun in Oita Pref., Chikujo-gun and Yame-gun in Fukuoka Pref., Yoshiki-gun and Kumage-gun in Yamaguchi Pref. and Saiki-gun in Hiroshima Pref. Other than these I made several researches in Ehime, Kochi and Oita Prefectures for ten years. In Honshu and Shikoku, however, I could not discover the spiders in question, nor their retreats (Fig. 1).

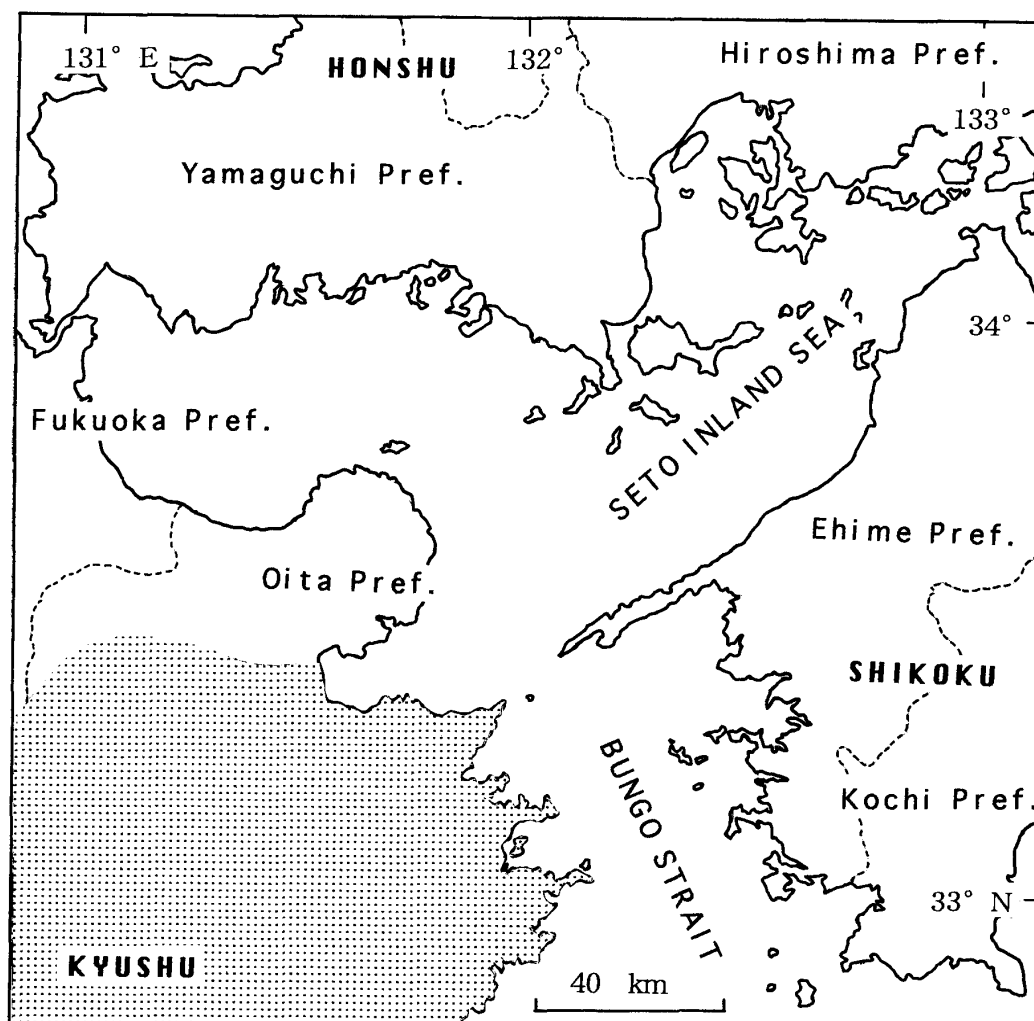


Fig. 1. Distribution of *Heptathela kikuyai* ONO, 1997 in the region around Seto Inland Sea, southern Japan (dotted portion). From white portions no heptatheline spider has been found.

KIKUYA (1994) studied on tolerance for flood damage of the *Heptathela* spiders and explained that these spiders were able to endure inundation by drifting and swimming. The moisture of earth should be an important factor for life of heptatheline spiders, because their retreats were always built in the soil which contains definite humidity kept by trees in the forests (ONO, 2000). KIKUYA also suggested that the distribution of *Heptathela* spiders should have a close connection with lineage of rivers.

It cannot be neglected to presume that the *Heptathela* spiders could drift across Bungo Strait or Seto Inland Sea with their biological abilities and extend their distribution eastward to Shikoku and Honshu. The westernmost point of Satamisaki Peninsula of Ehime Pref., Shikoku, is only about 10 km distant from Saganoseki of Oita Pref., Kyushu. However, the result of researches indicates that other geological factors hitherto unknown should be exist.

Besides, the northwestern edge of distributional range of the subfamily lies in lower basin of Hwangho River in Hebei and Shanxi Provinces in China. The northern barrier for distribution of heptatheline spiders may be the climate, mainly temperature, while the southern limit of the distributional range, probably in the mountainous areas of central Vietnam and Laos, can be decided by biological and evolutionary factors, for example, the relationships with spiders of the Liphistiinae. A line of the western limit can be easily drawn in the areas between temperate forests and grasslands or high mountains.

Taxonomic notes

The subfamily Heptathelinae seems to include some heterogeneous elements. HAUPT (1983) divided Japanese species into two genera, *Heptathela* and *Ryuthela* and discussed about phylogenetic relationships

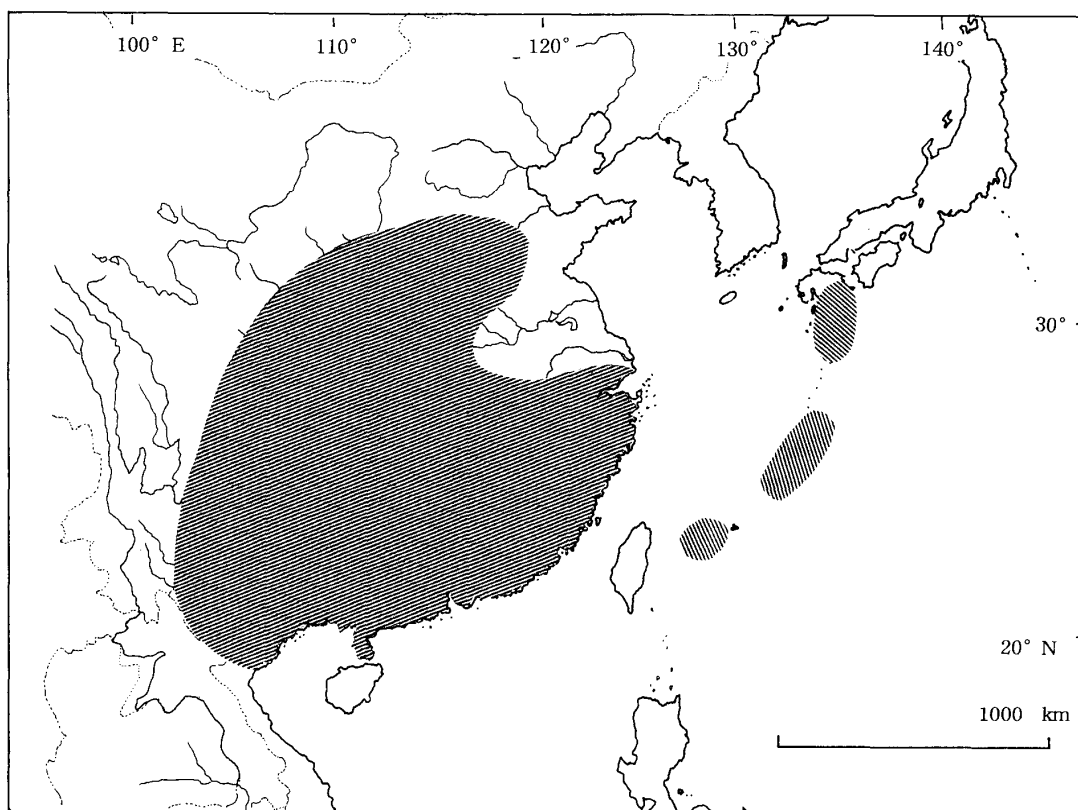


Fig. 2. Distributional range of the subfamily Heptathelinae in East Asia (shaded area).

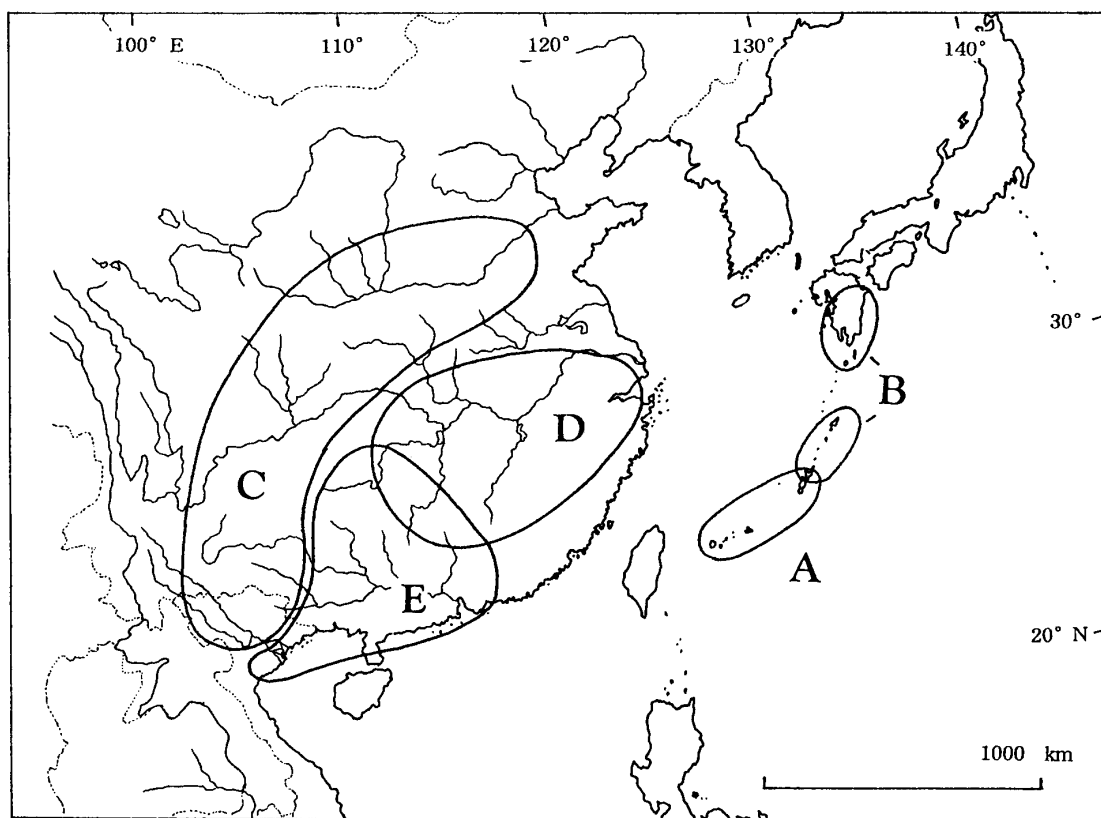


Fig. 3. Distribution of genera of the subfamily Heptathelinae. — A, *Ryuthela* HAUPT, 1983; B, *Heptathela* KISHIDA, 1923; C, *Abcathela* gen. nov.; D, *Songthela* gen. nov.; E, *Vinathela* gen. nov.

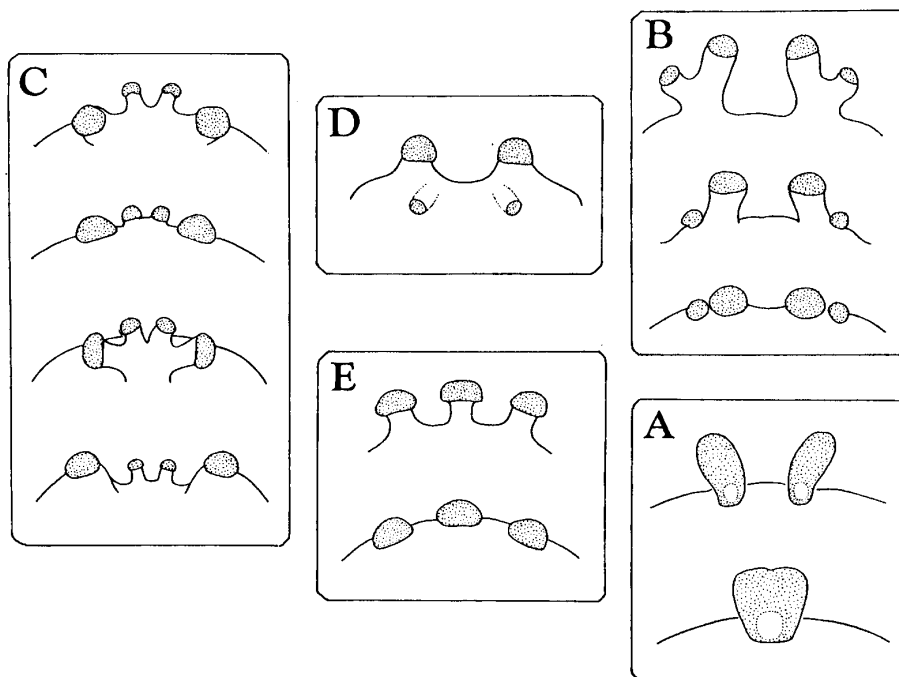


Fig. 4. Diagrams of female genitalia. — A, *Ryuthela* HAUPT, 1983; B, *Heptathela* KISHIDA, 1923; C, *Abcathela* gen. nov.; D, *Songthela* gen. nov.; E, *Vinathela* gen. nov.

of the species within Heptathelinae mainly based on the characters in male genital organ (HAUPT, 1990). On the other hand, RAVEN (1985) did not receive apomorphic characters selected by HAUPT and regarded that the monophyly of *Heptathela* + *Ryuthela* was in little doubt. Having accounted also much of characteristics in male organ, ONO & NISHIKAWA (1989) misunderstood relationships between *Heptathela amamiensis* HAUPT, 1983, from Ryukyu Islands, Japan, and the continental species, *H. hangzhouensis* CHEN, ZHANG et ZHU, 1981, and regarded that both species are close to each other.

In the recent paper of mine (ONO, 1999), I reexamined the species of Heptathelinae and performed a classification mainly based on the structure of female genitalia (Fig. 4). The species were classified into five groups with allopatry in their distribution (Fig. 3). As a measure to express diversity within the subfamily, these groups are herewith raised into the generic level as follows.

Family Liphistiidae THORELL, 1869
Subfamily Heptathelinae KISHIDA, 1923
Genus *Ryuthela* HAUPT, 1983

Heptathela: HAUPT, 1979, p. 356; RAVEN, 1985, p. 15; YAGINUMA, 1986, p. 2; CHIKUNI, 1989, pp. 18, 162.

Ryuthela HAUPT, 1983, p. 286; HAUPT, 1990, p. 135; ONO, 1997, p. 151.

Ryuthela (group A): ONO, 1999, p. 41.

Type species. *Heptathela nishihirai* HAUPT, 1979.

Species included. *Ryuthela ishigakiensis* HAUPT, 1983, *R. nishihirai* (HAUPT, 1979), *R. owadai* ONO, 1997, *R. sasakii* ONO, 1997, *R. secundaria* ONO, 1997, and *R. tanikawai* ONO, 1997.

Diagnosis. Female genitalia: A pair of monolobal spermathecae present, both the spermathecae close to each other (Fig. 4, A, top), or fused with one large opening (as in *R. sasakii*, Fig. 4, A, below).

Distribution. Japan (southern part of the Ryukyu Islands).

Genus *Heptathela* KISHIDA, 1923

Liphistius: KISHIDA, 1920, p. 360.

Heptathela KISHIDA, 1923, p. 235; YAGINUMA, 1986, p. 1; CHIKUNI, 1989, pp. 18, 162.

Heptathela (group B): ONO, 1999, p. 42.

Type species. *Liphistius kimurai* KISHIDA, 1920.

Species included. *Heptathela amamiensis* HAUPT, 1983, *H. higoensis* HAUPT, 1983, *H. kanenoi* ONO, 1996, *H. kikuyai* ONO, 1998, *H. kimurai* (KISHIDA, 1920), *H. nishikawai* ONO, 1998, *H. yaginumai* ONO, 1998, *H. yakushimaensis* ONO, 1998, and *H. yanbaruensis* HAUPT, 1983, stat. nov.

Diagnosis. Female genitalia: A pair of spermathecae present, spermathecae bilobal with secondary process laterally (Fig. 4, B).

Distribution. Japan (Kyushu and the northern part of the Ryukyu Islands).

Genus *Abcathela* nov.

Heptathela: SONG, ZHU & CHEN, 1999, p. 32.

Heptathela (group C): ONO, 1999, p. 42.

Type species. *Heptathela abca* ONO, 1999.

Species included. *Abcathela abca* (ONO, 1999), comb. nov., *A. bristowei* (GERTSCH, 1967), comb. nov., *A. heyangensis* (ZHU et WANG, 1984), comb. nov., *A. jiangnanensis* (CHEN et al., 1988), comb. nov., *A. schensiensis* (SCHENKEL, 1953), comb. nov., *A. sinensis* (BISHOP et CROSBY, 1932), comb. nov., and *A. yunnanensis* (SONG et HAUPT, 1984), comb. nov.

Etymology. The former part of the name is made by an arbitrary combination of letters and the latter part is from Greek word thele (nipple-like protuberance).

Diagnosis. Female genitalia: Two pair of spermathecae present, the lateral bursae larger and usually on thick bases, the median ones small and on tubular stems (Fig. 4, C).

Distribution. China (from Hebei to Yunnan) and Vietnam.

Genus *Songthela* nov.

Heptathela: SONG, ZHU & CHEN, 1999, p. 32.

Heptathela (group D): ONO, 1999, p. 42.

Type species. *Heptathela hangzhouensis* CHEN, ZHANG et ZHU, 1981.

Species included. *Songthela cipingensis* (WANG, 1989), comb. nov., *S. hangzhouensis* (CHEN, ZHANG et ZHU, 1981), comb. nov.

Etymology. Dedicated to Dr. SONG Daxiang, China.

Diagnosis. Female genitalia: Two pair of spermathecae present, the main bursae situated in more median position, the median ones moved posteriorly and situated at the base of main bursae (Fig. 4, D).

Distribution. China (from Zhejiang to Hunan).

Genus *Vinathela* nov.

Heptathela: SONG, ZHU & CHEN, 1999, p. 32.

Heptathela (group E): ONO, 1999, p. 42.

Type species. *Heptathela cucphuongensis* ONO, 1999.

Species included. *Vinathela cucphuongensis* (ONO, 1999), comb. nov., *V. hongkong* (SONG et WU, 1997), comb. nov., *V. hunanensis* (SONG et HAUPT, 1984), comb. nov., and *V. tonkingensis* (BRISTOWE, 1933), comb. nov.

Etymology. By a combination of vina (Vietnamese) and thele (nipple-like protuberance).

Diagnosis. Female genitalia: Three spermathecae present, two lateral bursae and one median one in same size (Fig. 4, E).

Distribution. China (Hunan) and Vietnam.

要 約

ハラフシグモ亜目 (Mesothelae) はハラフシグモ科 (Liphistiidae) 1 科からなり、ハラフシグモ属 (*Liphistius*) のみからなるハラフシグモ亜科 (Liphistiinae) と、キムラグモ属 (*Heptathela*) およびオキナワキムラグモ属 (*Rhythela*) の2属からなるキムラグモ亜科 (Heptathelinae) の2亜科に分類される。ハラフシグモ亜科においては40種以上がミャンマー、タイ、マレー半島、スマトラから知られ、キムラグモ亜科は約30種が日本、中国およびベトナムから記載されている。本論では、1998年に行なった瀬戸内海沿岸地域 (愛媛、大分、福岡、山口、広島) の調査や以前から行なってきた、大分県、愛媛県および高知県における調査によって得られた、ブンゴキムラグモ (*Heptathela kikuyai* ONO, 1998)

の分布に関するデータを整理し、キムラグモ亜科の東限地域における分布を動物地理学的に考察した。また、日本ならびにベトナムや中国の本類の資料を総合した分類学的検討 (ONO, 1999) をもとに、キムラグモ亜科を *Heptathela*, *Ryuthela*, *Abcathela* (新属), *Songthela* (新属) および *Vinathela* (新属) の 5 群に細分した。

References

- CHEN, Z.F., Z.H. ZHANG & C.D. ZHU, 1981. A new species of genus *Heptathela*. *J. Hangzhou Univ.*, 8: 305–308. (In Chinese.)
- CHIKUNI, Y., 1989. Pictorial Encyclopedia of Spiders in Japan. 306 pp. Kaisei-sha, Tokyo. (In Japanese.)
- HAUPT, J., 1979. Lebensweise und Sexualverhalten der mesothelen Spinne *Heptathela nishihirai* n. sp. (Araneae, Liphistiidae). *Zool. Anz., Jena*, 202: 348–374.
- HAUPT, J., 1983. Vergleichende Morphologie der Genitalorgane und Phylogenie der liphistiomorphen Webspinnen (Araneae: Mesothelae) I. Revision der bisher bekannten Arten. *Z. Zool. Sys. Evolut.-forsch.*, 21: 275–293.
- HAUPT, J., 1990. Comparative morphology and phylogeny of liphistiomorph spiders (Araneida: Mesothelae). III. Provisional diagram of relationships in Heptathelidae. In CELERIER, M.-L., J. HEURTAULT & C. ROLLARD (eds.): *Comptes Rendus du XIIème Colloque Européen d'Arachnologie*, pp.134–140. Société Européenne d'Arachnologie, Paris.
- KIKUYA, N., 1993. Historia naturalis: A Study of *Heptathela*. 211 pp. Yasaka-shobo, Tokyo. (In Japanese.)
- KIKUYA, N., 1994. Resistance to inundation and its utilization by *Heptathela kimurai* (Araneae: Liphistiidae). *Acta arachnol.*, 43: 193–208.
- KISHIDA, K., 1920. Occurrence of a liphistiid spider in Japan. *Zool. Mag., Tokyo*, 32: 360–363. (In Japanese.)
- KISHIDA, K., 1923. *Heptathela*, a new genus of liphistiid spider. *Annot. zool. japon.*, 10: 235–242.
- NAKAHIRA, K., 1973. [Spider watching trip to Ugurushima and Okinoshima Islands.] *Atypus*, (60): 18–26. (In Japanese.)
- ONO, H., 1997. A new species of the genus *Heptathela* (Araneae: Liphistiidae) from Vietnam. *Acta arachnol.*, 46: 23–28.
- ONO, H., 1998. Spiders of the genus *Heptathela* (Araneae, Liphistiidae) from Kyushu, Japan. *Mem. natn. Sci. Mus., Tokyo*, (30): 13–27.
- ONO, H., 1999. Spiders of the genus *Heptathela* (Araneae, Liphistiidae) from Vietnam, with notes on their natural history. *J. Arachnol.*, 27: 37–43.
- ONO, H., 2000. [Distribution and habitat of the spiders of the subfamily Heptathelinae (Araneae, Liphistiidae).] In: *Proceedings of the 23rd Annual Meeting of the Japanese Society of Soil Zoology*, p. 24. The Japanese Society of Soil Zoology and the Kanagawa Prefectural Museum of Natural History, Odawara City. (In Japanese.)
- ONO, H., & Y. NISHIKAWA, 1989. Taxonomic revision of the heptathelid spider (Araneae, Mesothelae) from Amami-oshima Island, the Ryukyus. *Mem. natn. Sci. Mus., Tokyo*, (22): 119–125.
- RAVEN, R.J., 1985. The spider infraorder Mygalomorphae (Araneae): Cladistics and Systematics. *Bull. Amer. Mus. nat. Hist.*, 182: 1–180.
- SAWAGUTI, Y., & Y. OZI, 1937. On *Heptathela Kimurai* (sic) (KISHIDA, 1920). *Acta arachnol.*, 2: 115–123.
- SONG, D.X. & J. HAUPT, 1984. Comparative morphology and phylogeny of liphistiomorph spiders (Araneae: Mesothelae). 2. Revision of new Chinese heptathelid species. *Verh. naturwiss. Ver. Hamburg, (NF)*, 27: 443–451.
- SONG, D.X., ZHU, M.S. & CHEN, J., 1999. The Spiders of China. 640 pp., pls. 1–4. Hebei Sci. Technol. Publ. House, Shijiazhuang.
- YAGINUMA, T., 1986. Spiders of Japan in Color (New Edition). 305 pp., 64 pls. Hoikusha, Osaka. (In Japanese.)